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Are Free School Meals failing families? Exploring the relationship between child food insecurity, child mental health and Free School Meal status during COVID-19: national cross-sectional surveys

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Are Free School Meals failing families? Exploring the relationship between child food insecurity, child mental health and Free School Meal status during COVID-19: national cross-sectional surveys

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Abstract

Objective: Food insecurity is linked to poor health and wellbeing in children, and rising prevalence rates have been exacerbated by COVID-19. Free School Meals (FSM) are considered a critical tool for reducing the adverse effects of poverty but apply a highly restrictive eligibility criteria. This study examined levels of food security and FSM status to support decision making regarding increasing the current eligibility criteria.

Design: Two cross-sectional national surveys administered in August-September 2020 and January-February 2021 were used to examine the impact of COVID-19 on the food experiences of children and young people.

Setting: United Kingdom.

Participants: 2,166 children (aged 7-17 years) and parents/guardians.

Main outcome measures: Participant characteristics were described by food security and FSM status; odds of poor mental health by food security and FSM status, adjusted for confounding variables.

Results: We observed food insecurity among both children who were or were not in receipt of FSM: 23% of children not receiving FSM were food insecure. Children who were food insecure had worse mental health compared to children who were food secure (Odds Ratio [OR]: 5.24, 95% Confidence Interval [95% CI]: 3.84 to 7.20); and this was lower among children receiving FSM (OR: 1.99, 95% CI: 1.42 to 2.78) compared to those who were not.

Conclusion: Many children experienced food insecurity regardless of whether they received FSM suggesting the eligibility criteria needs to be widened to prevent overlooking those in need.

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Keywords

Food insecurity, child food insecurity, free school meals, mental health, COVID-19.

Strengths and limitations

- Geographic and demographically-representative sample with wide range of ages of children
- Child-reported measures of food insecurity and mental health
- Parents may have helped their child complete the survey and influenced responses among younger children
- Analyses were not stratified by age though food insecurity may be experienced differently between those of younger and older ages
- We were unable to differentiate between eligibility and uptake

Introduction

The past decade has witnessed sharp rises in the use of food banks by households with children, suggesting that child food insecurity is rising[1]. Food insecurity can broadly be defined as uncertainty around the quality and quantity of food available[2]. Data from the Family Resource Survey (FRS) indicates that households with children are at particular risk of food insecurity in the UK [2–4]. In 2019/2020, five million people in the UK (8%) were in food insecure households, of whom 13% were children, 8% were working age adults, and 2% were pensioners [3]. Food insecurity has considerable implications for children, including associations with lower vegetable intake, higher added sugar intake [5,6], increased risk of obesity [4,7–9] and poorer academic performance [10]. There is a growing body of literature - almost entirely from North America - evidencing an association between the experience of food insecurity and an increase in the risk of mental health issues for children and adolescents [11–16]. Children and teenagers experiencing food insecurity report lower life satisfaction [12], and have a higher probability of seeing a psychologist and finding it difficult to make friends [17]. Evidence suggests that rates of depression [18], stress and anxiety are higher for children living in food insecure households [13,19,20]. Households with children have been particularly badly affected by the social and economic fallout of the COVID-19 pandemic. In the first six months of the pandemic, 12% of adults living with children reported skipping meals because they could not afford or access food, while 4% of adults with children reported going for a whole day without eating [21]. Food banks also reported a sharp rise in access by households with young children. Between early and mid-2020, The Trussell Trust food bank network supported 370,000 households, of which 320,000 were families with children. The proportion of couples with children referred to a food bank increased from 19% in early 2020 to 24% during the COVID-19 pandemic in mid-2020[22].

Free school meals (FSM) are considered to be a critical tool for mitigating the negative health effects of child poverty among low-income families. Children receiving FSM obtain a higher proportion of their daily energy and nutrient intakes from their school meals compared to those who pay [23,24] and FSM may therefore improve health and wellbeing and reduce health inequalities [25,26]. In England, FSM are currently a statutory entitlement available to eligible pupils, which include all infant school children (reception, year 1, and year 2) in state-funded schools (as part of the Education Act, 1944) [27]; and pupils in year 3 and upwards (junior school and secondary school pupils) whose parents meet income-defined eligibility criteria¹ and claim for FSM. As of 1 October 2020, there were 1.63 million pupils known to be eligible for FSM [28], an increase in the proportion eligible to 19.7% of all state-funded pupils from 17.3% in January 2020 and 15.4% in January 2019. This increase is likely due to increased unemployment during the COVID-19 pandemic rendering more children eligible for FSM, alongside increased uptake due to greater media attention and awareness of FSM.

FSM receipt can be considered a marker of poverty due to its restrictive eligibility criteria and children who receive FSM are likely to be living in low income households. The COVID-19 pandemic has exposed and amplified pre-existing concerns about the restrictive eligibility criteria for FSM (for pupils above year 2) and low uptake of FSM among eligible families (both before and after

¹ Parents currently meet the eligibility criteria if they receive: Income Support; Income-based Jobseekers Allowance; Income-related Employment and Support Allowance; Support under Part VI of the Immigration and Asylum Act 1999; the guaranteed element of State Pension Credit; Child Tax Credit (provided they are not also entitled to Working Tax Credit and have an annual gross income of no more than £16,190); Working Tax Credit run-on (paid for four weeks after a person stops qualifying for Working Tax Credit); and Universal Credit (with household income of less than £7,400 a year after tax and not including any benefits).

registration)[29]. The effects of the pandemic have been highly unequal, according to income, ethnicity, gender and health status [30–36]. There is evidence to suggest that low income families have been particularly negatively affected by the social and economic circumstances of the pandemic [37–39] and yet have thus far been largely neglected in the Governmental policy response. Emerging evidence suggests that families just outside of the eligibility criteria for FSM have struggled to afford food during the pandemic, potentially exacerbating child food insecurity [40]. However, this has not yet been formally assessed. This paper addresses this important and urgent research gap, examining the relationship between child food insecurity and families in receipt of and not in receipt of FSM during the pandemic. Given the known negative effects of food insecurity on child mental health and educational outcomes [10,11,41], the paper also looks at child mental health in the context of child food insecurity and receipt of FSM.

Methods

Study population and survey design

Data were taken from two Food Foundation commissioned surveys (ChildWise) conducted in the course of the COVID-19 pandemic to examine its impact on children and young people’s COVID-19 food experiences. The first (August-September 2020) and second surveys (January-February 2021) were carried out online using a carefully constructed framework to ensure a geographic and demographic representative sample of adults living in the UK with children and young people aged 7-17 years.

The online panel used by ChildWise is a member of the ESOMAR (European Society of Opinion and Marketing Research) organisation and endeavours to be as representative as possible. This panel is the largest in the UK and globally. To achieve representative quotas, the panel’s profiling data was first used to target the more difficult-to-reach demographics before targeting other groups. Samples were recruited to be representative by region, broad ethnic group, and spread evenly by age and gender.

Surveys were completed by parents or guardians (hereafter “parents”) of children with a section to be completed by children with the aid of parents if required. Parents were asked to list the ages and genders of all children in the household and one child was initially randomly allocated to complete the child portion of the survey. Parents completed questions on socio-demographic details and were asked to complete information about up to two of their children’s FSM status, age, and gender. Towards the end of the fieldwork period, children were non-randomly assigned to complete the child portion of the survey based on fulfilling any remaining quotas of age, gender, and geographic region. The children’s section included questions on perception of FSM, food insecurity and food bank use. In the second survey, additional questions on the child’s mental health were included in the children’s section.

Sociodemographic characteristics

We collapsed ethnicity from 12 categories into three: White (White British; Other White Background); Asian (Bangladeshi; Chinese; Indian; Pakistani; Other Asian Background) and Other (Black African; Black Caribbean; Other Black Background; Mixed background). Participants who chose “Prefer not to answer” were coded to missing.

Parental occupation was collapsed from 12 categories into two: Higher (Supervisory or clerical/ junior managerial/ professional/ administrative; Intermediate managerial/ professional/ administrative; Higher managerial/ professional/ administrative; Student) and Lower (Semi or unskilled manual work; Skilled manual worker; Casual worker - not in permanent employment; Housewife/Homemaker; Retired and living on state pension; Unemployed or not working due to long-term sickness; Full-time carer of other household member; Other).

Free School Meals

Parents were asked whether their child was currently registered for FSM. Responses were coded to “Yes” if parents responded “Yes” and “No” if parents responded “No”. Responses of “Don’t know” and “Prefer not to say” were coded to missing. Responses were similar to the question asked of children (“Thinking about when you have lunch at school, do you have Free School Meals?”).

Food insecurity

Participants were asked to think about being at home during the summer holidays (August–September 2020 survey) or the Christmas holidays and recent lockdown (January–February 2021 survey) and asked to respond to several statements regarding potential food insecurity. Participants were categorised as having “potential food insecurity” if they responded “Yes” to any of the following 6 statements: (1) Sometimes I was hungry but didn’t eat because I didn’t want to use up the food we had; (2) Sometimes I was hungry but didn’t eat because we didn’t have enough food in the house; (3) Sometimes my parents didn’t eat because we didn’t have enough food in the house; (4) Sometimes we had to eat less and make food last longer because we didn’t have the money to buy more; (5) Sometimes we didn’t eat proper meals because we didn’t have enough money to buy more food; (6) Sometimes I ate at friend’s houses because we didn’t have enough food in the house. Participants were categorised as not having potential food insecurity if they responded “Yes” to “I always had enough food to eat”. There were no participants who responded affirmatively to both “I always had enough to eat” and any of the other 6 statements. Participants who responded affirmatively to “Don’t know” or “Prefer not to say” were coded to missing.

Participants were also asked to respond to several statements regarding food bank use. They were coded to any food bank use if they responded “Yes” to having visited a food bank by themselves or if their family visited a food bank or coded to “No” if they responded “No, we didn’t visit a food bank”. Remaining participants were coded as not having used a food bank.

A dichotomous variable of “food insecurity” was then generated and included participants who were identified as having “potential food insecurity” (from the 6 questions) or indicated any food bank use. Participants who did not have “potential food insecurity” and did not indicate any food bank use were considered to be “food secure”.

Mental health

Children were asked how often they felt stressed or worried in the past month and were categorised as being stressed or worried “Every/most days” if they said they were worried “every day” or “most days”. Children were categorised as being stressed or worried “Some/rarely” if they said they were worried “Some days”, “Rarely”, or “I have not felt stressed once in the last month”.

Data analysis

All analyses were conducted in R version 4.0.2[42]. Responses were combined and analysed across both surveys. A small number of participants responded to both surveys (n=206). Their responses were removed from the first survey so that they were present in the analysis only once. Main analyses were conducted on a sample size of n=2,166.

Participant responses were described using mean (standard deviation [SD]) for continuous measures and number (n) and percentage (%) for categorical measures. We constructed 4 groups: (1) children with food insecurity who had FSM; (2) children with food insecurity who did not have FSM; (3) children without food insecurity who had FSM; (4) children without food insecurity who did not have FSM.

Differences between participant characteristics and responses to food insecurity questions, food bank use, and derived food insecurity by children who received or did not receive FSM were assessed using χ^2 or Fisher’s exact tests. A significant p-value ($p<0.05$) indicates that there is a difference between the characteristics by food security status among children who receive FSM and

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among children who do not receive FSM. In the subset of survey questions on children’s mental health, unadjusted and adjusted logistic regression was used to report odds of the child reporting feeling stressed or worried “every/most” days compared to “some/rarely” days regressed on food insecurity and FSM. A directed acyclic diagram (DAG) was drawn to assist in the selection of covariates (Supplementary file 1); confounding variables included in adjusted analyses of food insecurity with child mental health were ethnicity, parent occupation, and household occupancy. Variables included in adjusted analyses of FSM with child mental health were ethnicity, food insecurity, parent occupation, and household occupancy. Child age and sex were additionally adjusted to improve precision. Adjusted regressions can be interpreted as odds of children feeling stressed “every/most” days of the week for food insecure compared to food secure children or for children who received FSM compared to children who did not receive FSM, adjusting for covariates.

Results

Participant characteristics

The majority (78%) of parent respondents were aged 35-54 years old, were professionally employed (61.9%), and lived in households with two or three people (72%) (Table 1). The majority of children were White (78.8%) or Asian (11.4%) and female (57.2%) and just under a third of parents reported that their child received FSM (32%). Over a fifth of children reported any measure of food insecurity (21%) and over a quarter reported that they or their family had visited a food bank (25.9%), placing over a third of children living with food insecurity according to our definition (35%).

Among children who receive FSM, 60% were considered to have food insecurity (Table 2). Parents of children receiving FSM were younger, were more likely to be in a higher level of occupation, and less likely to be of White ethnicity. Over a fifth of children who did not receive FSM had food insecurity. Parents of children who did not receive FSM and had food insecurity were more likely to be younger than those not living with food insecurity. There was no difference in parental occupation between children who did not receive FSM and who lived with or without food insecurity with parents in both groups more likely to have a higher level of occupation.

Free school meals and potential food insecurity

More children receiving FSM reported any potential food insecurity measure than those not receiving FSM (42.8% among those who received FSM, 9.8% among those who did not; $p<0.05$; data not shown). Figure 1 shows the percentage of children responding affirmatively to each of the 6 potential food insecurity questions by FSM status. Children receiving FSM were more likely to respond affirmatively to these questions, though many who did not receive FSM also indicated potential food insecurity. Among all children, the most commonly chosen item reported was having to eat less in order to make food last longer due to a lack of money to buy more food.

Free school meals and food bank use

Both children who did and did not receive FSM reported visiting a food bank, whether by themselves or their family (Figure 2). Children who received FSM were more likely to have reported visiting a food bank by themselves or their family than children not receiving FSM. We found 2.7% of children not receiving FSM visited a food bank by themselves while 9.8% reported their families had visited a foodbank.

Child’s mental health

Daily stress or worries were reported more frequently by children experiencing food insecurity compared to those food secure, whether in receipt of FSM (41%) or not (22%) (Figure 3). Children experiencing food insecurity had over five times the odds of feeling stressed every day or most days compared to children who were food secure (Table 3). This likelihood was reduced when taking food insecurity into account, with children who received FSM having twice the odds of feeling stressed or worried most days or every day compared to children who did not receive FSM.

Discussion

In this family-based survey measuring experiences of the COVID-19 pandemic, we found a substantial number of children experienced food insecurity (defined here as having ever visited a food bank or experienced any food insecurity measure) regardless of whether they were in receipt of FSM. Food insecurity and measures of potential food insecurity were highest among children in receipt of FSM, likely reflecting the very low income threshold for FSM (currently £7,400), meaning that outside of universal infant provision (in England and Scotland), it is largely children in the very poorest families who receive FSM. In a subset of children with mental health measures, we found that children who experienced food insecurity had increased odds of feeling stressed or worried on an almost-daily basis in the previous month compared to children who were food secure.

Children are often protected from hunger in families that experience food insecurity where parents report decreasing their own intake to shield their children [43–46]. We found that children reported their parents skipping meals due to a lack of food in the house. However, it was concerning that we also found children reporting hunger due to not having enough food in the house and almost a fifth of all children living with food insecurity reporting having to eat less to make food stretch. The high proportion of children with food insecurity reporting food bank use is consistent with other reports that have highlighted the impact of the pandemic on levels of food insecurity [1]. The consequences of the pandemic on financial stability and, therefore, food insecurity, have also impacted families who may not have been previously affected.

Studies have observed food insecurity among the employed and recent data in the UK Longitudinal Household Study on food insecurity during the pandemic suggests that, while risk of food insecurity increases more for those who were unemployed, those who are persistently employed were also at risk [47–50]. The pandemic has exposed the notion that food insecurity occurs primarily among the unemployed or those less-skilled professions; over 50% of children reporting food insecurity in our data had parents with higher/professional levels of occupation. Educational attainment and income are not necessarily protective of food insecurity. In the 2019/2020 FRS, it was reported that 8% of households where the head of household obtained A-levels or Scottish Highers and 4% of households with further education and university qualifications were food insecure [3]. Likewise, increasing income increased the food security but even among those with a gross weekly income of £1,000 or more only 96% had high food security (meaning 4% experienced food insecurity), compared to 74% of households with a total gross weekly income of less than £200 have high food security.

Over 25% of all children and almost 50% of children living with food insecurity reported their families visiting a food bank. Previous research has suggested that use of food banks by UK households experiencing food insecurity is low [51,52]; however, our study suggests that, in the context of the pandemic, food bank use may have become more common for families experiencing food poverty. Food banks are a short-term 'emergency' response and concerns have been raised about the nutritional quality [53,54] and cultural adequacy of the food provided [55]. The emergence and continuation of food banks and the growing number of food parcels they provide may be seen as an example of 'successful' self-organisation around a need and conveys a sense that something is being

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done; however, it should be questioned whether it is the responsibility of the voluntary sector, rather than the Government, to provide access to something as basic as having food of sufficient quality and quantity. Food banks are often unable to provide fresh foods or ensure dietary requirements are met; continued reliance and widespread use of food banks, particularly among households with children, raises concerns about the long-term mental and physical implications for families relying on this form of ‘emergency’ support.

FSM are often seen as an essential tool for mitigating the effects of poverty experienced by children but provision is not universal or standardised across all nations, leading to unequal access (see Patrick et al., 2021). Our data reported more children registered for FSM (32%) compared to those reported eligible in autumn 2020 (19.7%) [28]. This may be reflected by an increase in newly-qualifying children for FSM as families lost income; in the first survey, over 40% of children registered for FSM had only recently started receiving FSM (i.e., were newly eligible that term) [21]. Once children age out of universal provision, stringent criteria must be met for children to receive FSM with many of the criteria being income-based, leading to only very low-income families being eligible and many low-income families going hungry. The eligibility is so restrictive that in our sample nearly half of families who are food insecure do not receive FSM; the eligibility threshold is set at an annual household income of less than £7,400 prior to benefits while parents receiving Working Tax Credit are ineligible for FSM support regardless of their level of income. However, as we have shown, a large proportion of children experiencing food insecurity as well as those in receipt of FSM have parents employed in professional-level occupations. This suggests that the financial circumstances of families of all income levels have been hard-hit by the pandemic and that the current criteria may not be suitable for assessing eligibility. In addition, our findings that children who were receiving FSM still reported hunger suggests that FSM provision may not be sufficient to ensure that children are adequately fed on a daily basis.

There is limited published research in the UK on the role food insecurity plays in children’s mental health, and none on the role of FSM in mitigating the association between food insecurity and poor mental health among children. Emerging UK evidence suggests poorer wellbeing and increased emotional and behavioural problems among children who experience food insecurity. One UK study found 27% of 10-year old children experiencing food insecurity exhibited clinically significant behavioural problems compared to 10% of children who were food secure[56]. Our findings that children who experience food insecurity have worse mental health are therefore unsurprising, and in line with North American literature on food insecurity and child mental health[11–16]. This strength of association was reduced when we examined the relationship between receipt of FSM and children reporting feeling stressed or worried and accounting for food insecurity, suggesting that FSM helped alleviate the burden of poverty and food insecurity. However, children who received FSM still had higher odds of reporting feeling stressed or worried compared to children who did not receive FSM. This could potentially reflect the complex poverty-related stressors of living in a household eligible for FSM as well as the perceived stigma of receiving FSM[37,57]. Children who received FSM in this survey were asked whether they think it is embarrassing to have FSM and 11.5% of children living with food insecurity thought it was embarrassing compared to 4.1% of children who were food secure. This suggests children may carry an additional burden of stigma on top of inadequate food security.

There are multiple strengths and limitations to this study. This study used a geographic and demographically-representative sample with a wide range of ages and included measures of child-reported food insecurity combined with child reported mental health. However, we were unable to understand the degree to which parents may have helped their child complete the questions, and whether responses were given by them or were changed/given by their parents. This is more likely to have influenced responses from the younger children completing the survey. We also did not

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3 stratify the sample to distinguish between children in primary or secondary school, which may
4 reflect differences in how food insecurity is experienced, such as visiting a food bank themselves, as
5 well as differential uptake in FSM regardless of eligibility. We were also unable to differentiate
6 between eligibility and uptake and whether the 23% of children experiencing food insecurity but not
7 receiving FSM were due to non-eligibility or from voluntary refusal as a result of stigma or other
8 reasons for not participating when eligible, such as navigating the application process.
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11 Our findings confirm a real need to reconsider the eligibility criteria currently set for the provision of
12 FSM. A concerning number of children are experiencing food insecurity in families with
13 higher/professional levels of education who are likely to be above the eligibility threshold for FSM.
14 While more families can be helped by widening eligibility, and more work is needed to understand
15 access and uptake of FSM, including potential barriers such as social shame, policies which provide
16 universal coverage should be considered as the impact goes beyond food provision and eliminates
17 the stigma that is associated with being eligible and receiving FSM.
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Competing interests

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/disclosure-of-interest/ and declare: support from the Bradford Institute for Health Research and the University of York; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Transparency statement

The corresponding author (TY) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported. No important aspects of the study have been omitted and any discrepancies from the study as originally planned have been disclosed.

Dissemination to participants and related patient and public communities

Findings will be disseminated through media outreach to the general public.

Contributors

TCY, MP, RHM, MB designed and planned the study. MB acquired the data. TCY performed the statistical analysis and was responsible for the initial draft of the manuscript. All authors were involved in interpreting the study results, revising the manuscript, and approving the final version for submission. MB is the guarantor. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Ethics approval

None required.

Data availability statement

The datasets analysed during the current study are not freely available. Applications to access the data can be made to The Food Foundation.

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Table 1. Characteristics of the survey population.

	Total sample n=2166	
	N	Mean (SD)/%
Parent age		
18-24	8	0.4
25-34	268	12.4
35-44	923	42.6
45-54	762	35.2
55-64	205	9.5
Parent occupation		
Higher	1341	61.9
Lower	825	38.1
Geographical region		
East Midlands	158	7.3
Eastern	196	9
London	282	13
North East	92	4.2
North West	240	11.1
Northern Ireland	73	3.4
Scotland	161	7.4
South East	300	13.9
South West	197	9.1
Wales	109	5
West Midlands	182	8.4
Yorkshire & Humberside	176	8.1
Number in household		
2	160	7.4
3	624	28.8
4	939	43.4
5	318	14.7
6+	125	5.8
Child's ethnicity		
Asian	245	11.4
Other	209	9.7
White	1691	78.8
Child's age	2166	12.4 (3.2)
Child sex		
Female	1076	49.7
Male	1090	50.3
Child receives FSM		
Yes	675	31.5
No	1467	68.5
Potential food insecurity		
Yes	431	20.6
No	1659	79.4

Any food bank use		
Yes	561	25.9
No	1605	74.1
Food insecure*		
Yes	763	35.2
No	1403	64.8

*Defined as responding affirmatively to any of the 6 potential food insecurity questions or indicated any food bank use

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Table 2. Food insecurity and food bank use by children who receive or do not receive free school meals.

	Receives FSM					Does not receive FSM				
	Food insecurity n=407 (60%)		No food insecurity n=268 (40%)		<i>p</i> -value*	Food insecurity n=338 (23%)		No food insecurity n=1129 (77%)		<i>p</i> -value*
	N	%	N	%		N	%	N	%	
Parent age					<0.001					<0.001
18-24	5	1.2	0	0		1	0.3	2	0.2	
25-34	91	22.4	44	16.4		43	12.7	87	7.7	
35-44	194	47.7	115	42.9		167	49.4	436	38.6	
45-54	97	23.8	75	28		107	31.7	474	41.9	
55-64	20	4.9	34	12.7		20	5.9	130	11.5	
Parent occupation					<0.001					0.1
Higher	238	58	106	40		214	63	754	68	
Lower	169	42	162	60		124	37	364	32	
Number in household					0.6					0.2
2	37	9.1	29	10.8		25	7.4	63	5.6	
3	123	30.2	80	29.9		106	31.4	311	27.5	
4	164	40.3	95	35.4		142	42	527	46.7	
5	51	12.5	43	16		46	13.6	177	15.7	
6+	32	7.9	21	7.8		19	5.6	51	4.5	
Child's ethnicity					0.04					0.8
Asian	66	16	30	11		35	10.5	110	9.8	
Other	57	14	28	10		30	9	91	8.1	
White	282	70	210	78		268	80.5	916	82	

* χ^2 or Fisher's exact test

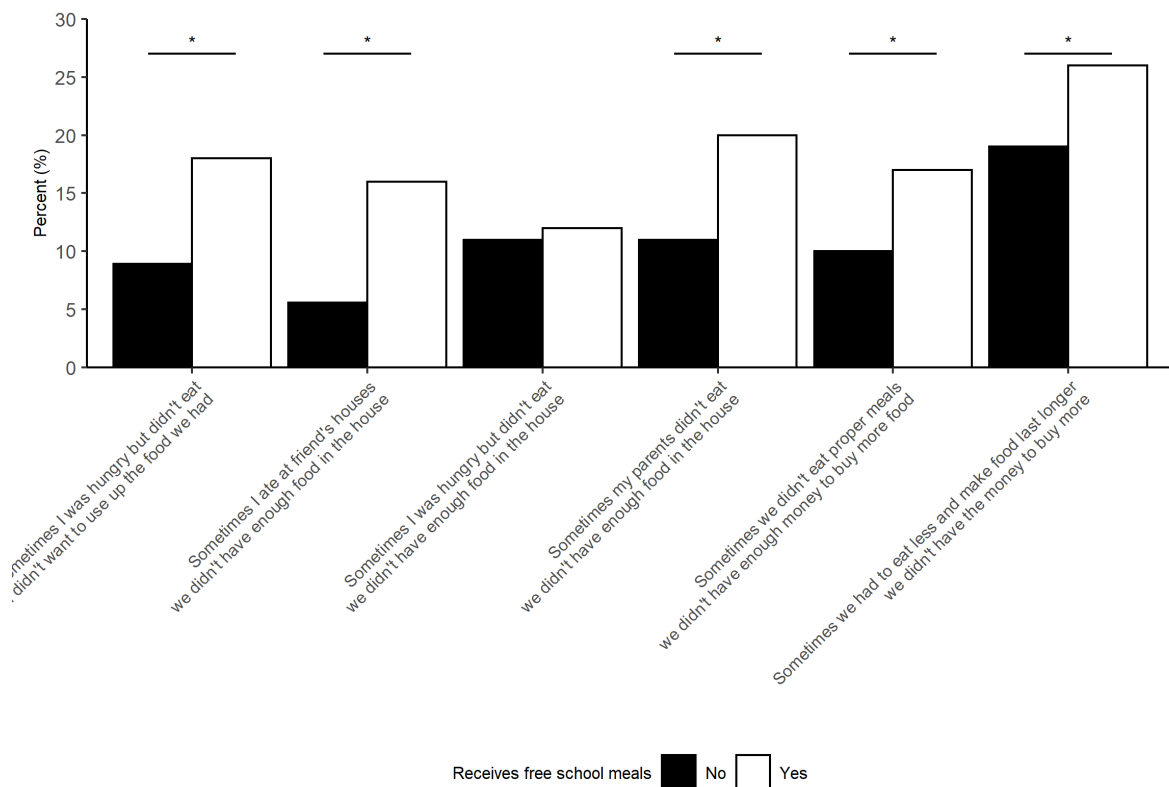
Table 3. Odds of children reporting feeling stressed every day or most days in the past month.

	Unadjusted			Adjusted		
	N	OR	95% CI	N	OR	95% CI
Food insecurity*	1289	4.42	(3.29, 5.97)	1276	5.24	(3.84, 7.20)
Receives FSM**	1276	2.81	(2.10, 3.76)	1265	1.99	(1.42, 2.78)

*adjusted for child’s age and sex, ethnicity, parent occupation, household occupancy

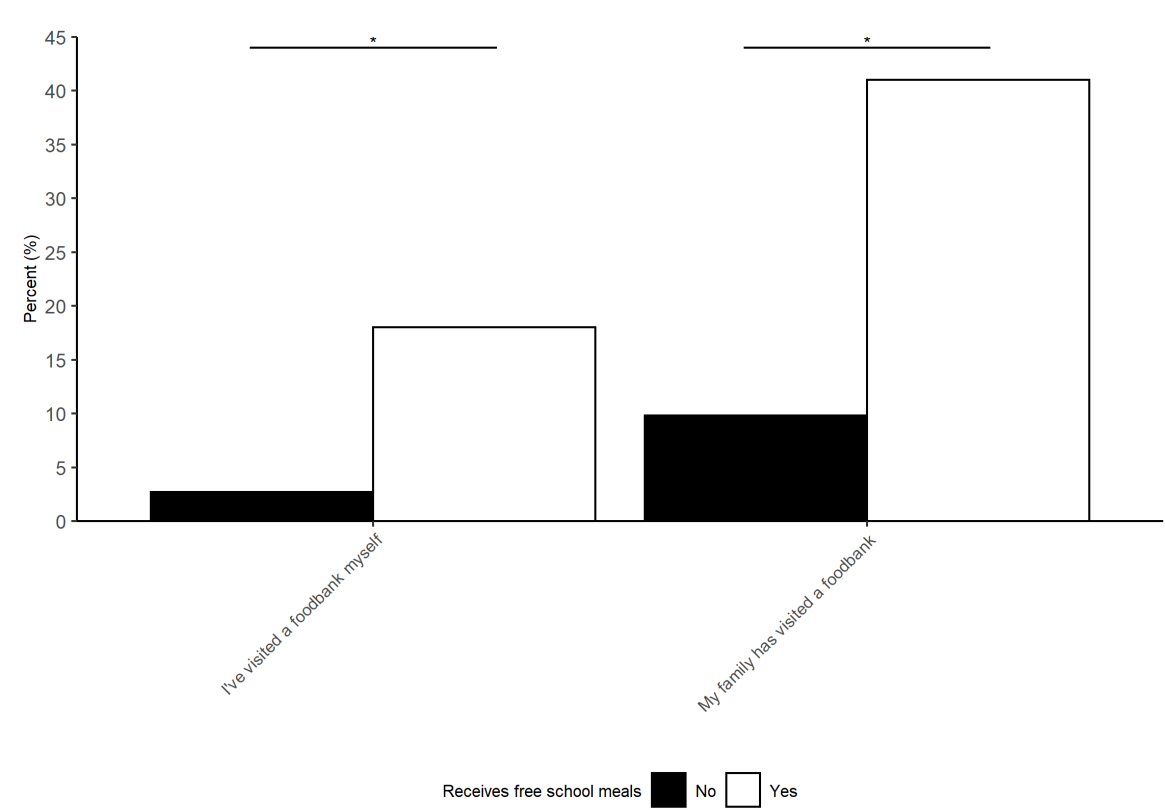
**adjusted for child's age and sex, ethnicity, food insecurity, parent occupation, household occupancy

Figure 1. Percentage of children responding affirmatively to the six questions indicating potential food insecurity questions by FSM status.



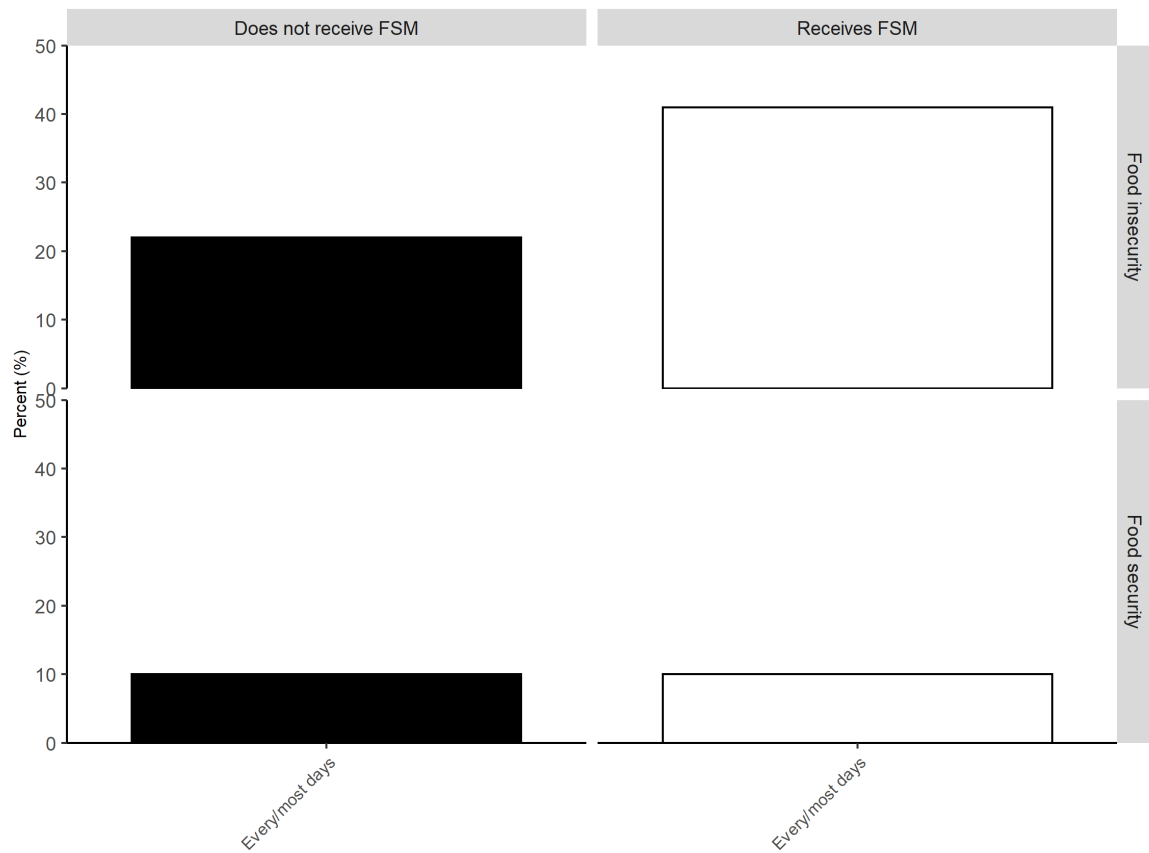
*p<0.05

Figure 2. Percentage of children responding affirmatively to two questions indicating food bank use by FSM status.



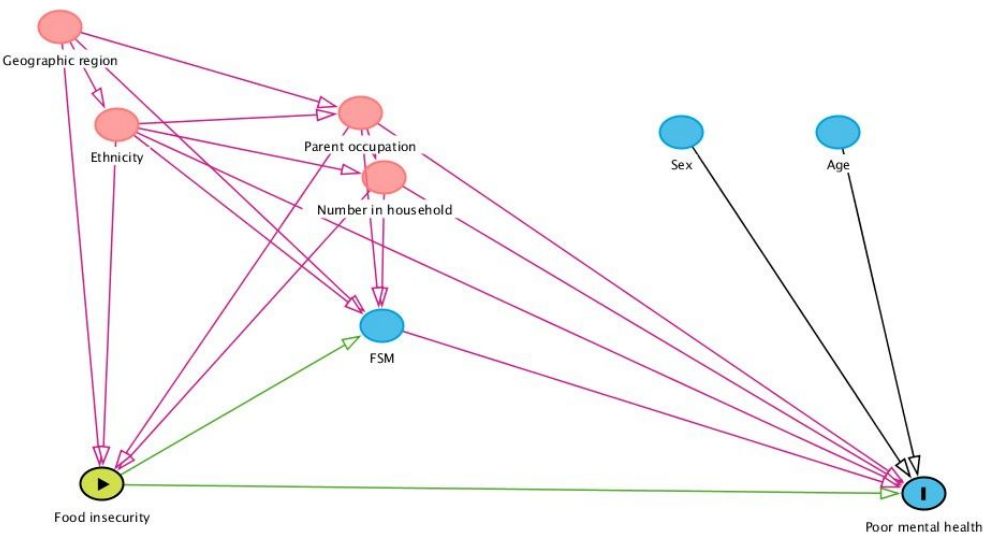
*p<0.05

Figure 3. Percentage of children reporting sadness or worries in the past month according to FSM and food insecurity status.

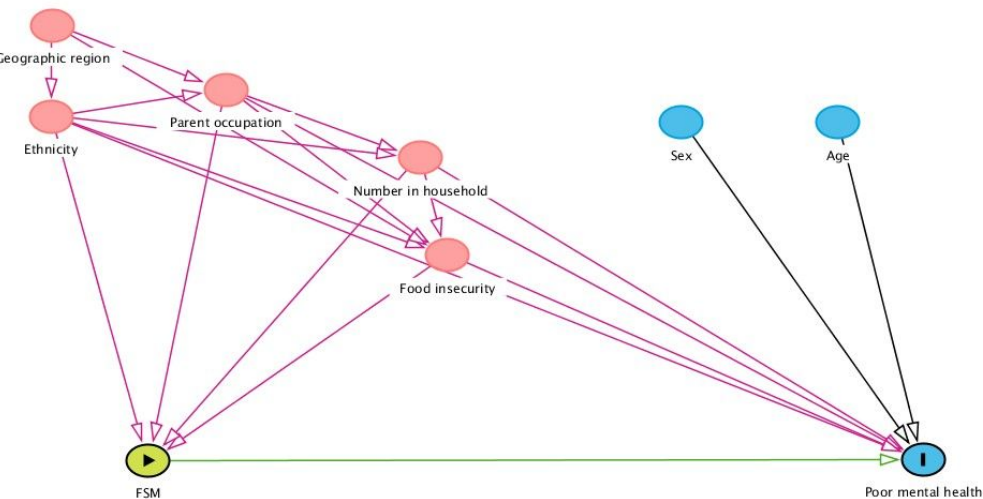


Supplementary file 1. DAGs for (1) food insecurity and child mental health; (2) FSM and child mental health.

(1)



(2)



STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract page 1 (b) Provide in the abstract an informative and balanced summary of what was done and what was found page 1-2
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported page 3-4
Objectives	3	State specific objectives, including any prespecified hypotheses page 4
Methods		
Study design	4	Present key elements of study design early in the paper page 4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection page 5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants page 4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable pages 4-5
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group pages 4-5
Bias	9	Describe any efforts to address potential sources of bias page 6
Study size	10	Explain how the study size was arrived at page 5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why pages 4-6
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding pages 5-6 (b) Describe any methods used to examine subgroups and interactions pages 5-6 (c) Explain how missing data were addressed page 5 (d) If applicable, describe analytical methods taking account of sampling strategy pages 4-5 (e) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed page 4-5 (b) Give reasons for non-participation at each stage page 4 (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders page 6 (b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures page 6-7
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included page 7 (b) Report category boundaries when continuous variables were categorized

(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives pages 7-8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias page 9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence pages 7-9
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based page 14

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Are Free School Meals failing families? Exploring the relationship between child food insecurity, child mental health and Free School Meal status during COVID-19: national cross-sectional surveys

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Are Free School Meals failing families? Exploring the relationship between child food insecurity, child mental health and Free School Meal status during COVID-19: national cross-sectional surveys

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Abstract

Objective: Food insecurity is linked to poor health and wellbeing in children, and rising prevalence rates have been exacerbated by COVID-19. Free School Meals (FSM) are considered a critical tool for reducing the adverse effects of poverty but apply a highly restrictive eligibility criteria. This study examined levels of food security and FSM status to support decision making regarding increasing the current eligibility criteria.

Design: Two cross-sectional national surveys administered in August-September 2020 and January-February 2021 were used to examine the impact of COVID-19 on the food experiences of children and young people.

Setting: United Kingdom.

Participants: 2,166 children (aged 7-17 years) and parents/guardians.

Main outcome measures: Participant characteristics were described by food security and FSM status; odds of poor mental health, reported as children reporting feeling stressed or worried in the past month, by food security and FSM status, adjusted for confounding variables.

Results: We observed food insecurity among both children who were or were not in receipt of FSM: 23% of children not receiving FSM were food insecure. Children who were food insecure had worse mental health compared to children who were food secure (Odds Ratio [OR]: 5.24, 95% Confidence Interval [95% CI]: 3.84 to 7.20); and this was lower among children receiving FSM (OR: 1.99, 95% CI: 1.42 to 2.78) compared to those who were not.

Conclusion: Many children experienced food insecurity regardless of whether they received FSM suggesting the eligibility criteria needs to be widened to prevent overlooking those in need.

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Keywords

Food insecurity, child food insecurity, free school meals, mental health, COVID-19.

Strengths and limitations

- Geographic and demographically-representative sample with wide range of ages of children
- Child-reported measures of food insecurity and mental health
- Parents may have helped their child complete the survey and influenced responses among younger children
- Analyses were not stratified by age though food insecurity may be experienced differently between those of younger and older ages
- We were unable to differentiate between eligibility and uptake

Introduction

The past decade has witnessed sharp rises in the use of food banks by households with children, suggesting that child food insecurity is rising[1]. In that decade, the Trussell Trust reported a 31-fold increase in the number of emergency food parcels distributed, from 61,000 in 2010-2011 to 1.9 million in 2019/2020 [2]. Food insecurity can broadly be defined as uncertainty around the quality and quantity of food available [3]. Data from the Family Resource Survey (FRS) prior to the COVID-19 pandemic indicates that households with children are at particular risk of food insecurity in the UK [3–5]. In 2019/2020, five million people in the UK (8%) were in food insecure households, of whom 13% were children, 8% were working age adults, and 2% were pensioners [4]. Food insecurity has considerable nutritional, physical, and cognitive implications for children, including, but not limited to, associations with lower vegetable intake, higher added sugar intake [6,7], increased risk of obesity [5,8–10] and poorer academic performance [11,12]. There is a growing body of literature - almost entirely from North America - evidencing an association between the experience of food insecurity and an increase in the risk of mental health issues for children and adolescents [13–18]. Children and teenagers experiencing food insecurity report lower life satisfaction [14], and have a higher probability of seeing a psychologist and finding it difficult to make friends [19]. Evidence suggests that rates of depression [20], stress and anxiety are higher for children living in food insecure households [15,21,22]. Households with children have been particularly badly affected by the social and economic fallout of the COVID-19 pandemic. In the first six months of the pandemic, 12% of adults living with children reported skipping meals because they could not afford or access food, while 4% of adults with children reported going for a whole day without eating [23]. Food banks also reported a sharp rise in access by households with young children. Between early and mid-2020, The Trussell Trust food bank network supported 370,000 households, of which 320,000 were families with children. The proportion of couples with children referred to a food bank increased from 19% in early 2020 to 24% during the COVID-19 pandemic in mid-2020 [2].

Free school meals (FSM) are considered to be a critical tool for mitigating the negative health effects of child poverty among low-income families. Children receiving FSM obtain a higher proportion of their daily energy and nutrient intakes from their school meals compared to those who pay [24,25] and FSM may therefore improve health and wellbeing and reduce health inequalities [26,27]. In England, FSM are currently a statutory entitlement available to eligible pupils, which include all infant school children (reception, year 1, and year 2) in state-funded schools (as part of the Education Act, 1944) [28]; and pupils in year 3 and upwards (junior school and secondary school pupils) whose parents meet income-defined eligibility criteria¹ and claim for FSM. As of 1 October 2020, there were 1.63 million pupils known to be eligible for FSM, including those part of the universal FSM offer, [29], an increase in the proportion eligible to 19.7% of all state-funded pupils from 17.3% in January 2020 and 15.4% in January 2019. This increase is likely due to increased unemployment during the COVID-19 pandemic rendering more children eligible for FSM, alongside increased uptake due to greater media attention and awareness of FSM.

FSM receipt can be considered a marker of poverty due to its restrictive eligibility criteria and children who receive FSM are likely to be living in low income households. The COVID-19 pandemic

¹ Parents currently meet the eligibility criteria if they receive: Income Support; Income-based Jobseekers Allowance; Income-related Employment and Support Allowance; Support under Part VI of the Immigration and Asylum Act 1999; the guaranteed element of State Pension Credit; Child Tax Credit (provided they are not also entitled to Working Tax Credit and have an annual gross income of no more than £16,190); Working Tax Credit run-on (paid for four weeks after a person stops qualifying for Working Tax Credit); and Universal Credit (with household income of less than £7,400 a year after tax and not including any benefits).

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has exposed and amplified pre-existing concerns about the restrictive eligibility criteria for FSM (for pupils above year 2) and low uptake of FSM among eligible families (both before and after registration)[30]. The effects of the pandemic have been highly unequal, according to income, ethnicity, gender and health status [31–37]. There is evidence to suggest that low income families have been particularly negatively affected by the social and economic circumstances of the pandemic [38–40] and yet have thus far been largely neglected in the Governmental policy response. Emerging evidence suggests that families just outside of the eligibility criteria for FSM have struggled to afford food during the pandemic, potentially exacerbating child food insecurity [41]. However, this has not yet been formally assessed. This paper addresses this important and urgent research gap, examining the relationship between child food insecurity and families in receipt of and not in receipt of FSM during the pandemic. Given the known negative effects of food insecurity on child mental health and educational outcomes [11,13,42], the paper also looks at child mental health in the context of child food insecurity and receipt of FSM.

Methods

Study population and survey design

Data were taken from two Food Foundation commissioned surveys (ChildWise) conducted in the course of the COVID-19 pandemic to examine its impact on children and young people’s COVID-19 food experiences. The first (August-September 2020; response rate: 10%) and second surveys (January-February 2021; response rate: 28%) were carried out online using a carefully constructed framework to ensure a geographic and demographic representative sample of adults living in the UK with children and young people aged 7-17 years. Children younger than 7 years of age, including children aged 7 in Year 2 of primary school, were excluded in order to capture children’s experiences outside of universal FSM provision.

The online panel used by ChildWise is a member of the ESOMAR (European Society of Opinion and Marketing Research) organisation and endeavours to be as representative as possible. This panel is the largest in the UK and globally. To achieve representative quotas, the panel’s profiling data was first used to target the more difficult-to-reach demographics before targeting other groups. Samples were recruited to be representative by region, broad ethnic group, and spread evenly by age and gender.

Surveys were completed by parents or guardians (hereafter “parents”) of children with a section to be completed by children with the aid of parents if required. Parents were asked to list the ages and genders of all children in the household and one child was initially randomly allocated to complete the child portion of the survey. Parents completed questions on socio-demographic details and were asked to complete information about up to two of their children’s FSM status, age, and gender. Children completed questions on perception of FSM, food insecurity and food bank use. In the second survey, additional questions on the child’s mental health were included in the children’s section. Towards the end of the fieldwork period, children were non-randomly assigned to complete the child portion of the survey based on fulfilling any remaining quotas of age, gender, and geographic region.

Patient and public involvement

The survey used in this study was developed in partnership with Food Foundation, who have established a group of young food ambassadors to help set priority areas. This group meets on a regular basis to discuss important and emerging areas of interest that have the best chance of policy change. They have provided advice on asking questions to young people and the methodological approach used.

Sociodemographic characteristics

Parents completed questions on their and their child's age and gender, their child, their ethnicity and occupation of the Chief Income Earner. We collapsed ethnicity from 12 categories into three: White (White British; Other White Background); Asian (Bangladeshi; Chinese; Indian; Pakistani; Other Asian Background) and Other (Black African; Black Caribbean; Other Black Background; Mixed background). Participants who chose "Prefer not to answer" were coded to missing.

Parental occupation was reported for the Chief Income Earner in the household, defined as the individual within the household with the largest income. If the Chief Income Earner was not in paid employment but has been out of work for fewer than 6 months, the most recent occupation was reported. If the Chief Income Earner was retired with an occupation pension, then the most recent occupation was reported. Twelve categories of occupations were collapsed by ChildWise into two categories of social grade (ABC1 and C2DE), with the higher occupational class as a shorthand for middle class (ABC1) and the lower occupational class as shorthand for working class (C2DE): Higher (Supervisory or clerical/ junior managerial/ professional/ administrative; Intermediate managerial/ professional/ administrative; Higher managerial/ professional/ administrative; Student) and Lower (Semi or unskilled manual work; Skilled manual worker; Casual worker - not in permanent employment; Housewife/Homemaker; Retired and living on state pension; Unemployed or not working due to long-term sickness; Full-time carer of other household member; Other).

Free School Meals

Parents were asked whether their child was currently registered for FSM. Responses were coded to "Yes" if parents responded "Yes" and "No" if parents responded "No". Responses of "Don't know" and "Prefer not to say" were coded to missing. Responses were similar to the question asked of children ("Thinking about when you have lunch at school, do you have Free School Meals?").

Food insecurity

Children were asked to think about being at home during the summer holidays (August-September 2020 survey) or the Christmas holidays and recent lockdown (January-February 2021 survey) and asked to respond to several statements regarding potential food insecurity. Children were categorised as having "potential food insecurity" if they responded "Yes" to any of the following 6 statements: (1) Sometimes I was hungry but didn't eat because I didn't want to use up the food we had; (2) Sometimes I was hungry but didn't eat because we didn't have enough food in the house; (3) Sometimes my parents didn't eat because we didn't have enough food in the house; (4) Sometimes we had to eat less and make food last longer because we didn't have the money to buy more; (5) Sometimes we didn't eat proper meals because we didn't have enough money to buy more food; (6) Sometimes I ate at friend's houses because we didn't have enough food in the house. Children were categorised as not having potential food insecurity if they responded "Yes" to "I always had enough food to eat". There were no children who responded affirmatively to both "I always had enough to eat" and any of the other 6 statements. Children who responded affirmatively to "Don't know" or "Prefer not to say" were coded to missing.

Children were also asked to respond to several statements regarding food bank use. They were coded to any food bank use if they responded "Yes" to having visited a food bank by themselves or if their family if they responded "No" to the statement "No, we didn't visit a food bank". Remaining children were coded as not having used a food bank.

A dichotomous variable of "food insecurity" was then generated and included children who were identified as having "potential food insecurity" (from the 6 questions) or indicated any food bank use. Children who did not have "potential food insecurity" and did not indicate any food bank use were considered to be "food secure". Children who responded "yes" to any of the "potential food insecurity" questions or indicated that they or their family had visited a food were considered to be "food insecure".

Mental health

Among children who responded affirmatively that they received FSM, they were asked to select from a range of statements on how they felt about FSM. We examined their responses to “I think it is embarrassing to have free school meals”; affirmative responses were coded to “Yes, embarrassed” and negative responses were coded to “No, not embarrassed”.

Children participating in the January-February 2021 survey were asked how often they felt stressed or worried in the past month and were categorised as being stressed or worried “Every/most days” if they said they were worried “every day” or “most days”. Children were categorised as being stressed or worried “Some/rarely” if they said they were worried “Some days”, “Rarely”, or “I have not felt stressed once in the last month”.

Data analysis

All analyses were conducted in R version 4.0.2[43]. Responses were combined and analysed across both surveys. We examined differences in characteristics by survey period and did not find differences by measures of food insecurity or receipt of FSM (Supplementary file 1). A small number of participants responded to both surveys (n=206). Their responses were removed from the first survey so that they were present in the sample only once and were able to be part of the mental health analysis. Participants who responded to both surveys were less likely to have used a food bank or be food insecure (Supplementary file 2). Main analyses were completed on a sample size of n=2,166.

Responses were described using mean (standard deviation [SD]) for continuous measures and number (n) and percentage (%) for categorical measures. We constructed 4 groups: (1) children with food insecurity who had FSM; (2) children with food insecurity who did not have FSM; (3) children without food insecurity who had FSM; (4) children without food insecurity who did not have FSM.

Differences between participant characteristics and responses to food insecurity questions, food bank use, and derived food insecurity by children who received or did not receive FSM were assessed using χ^2 or Fisher’s exact tests for categorical variables and Welch’s two-sample t-test for continuous variables. A significant p-value ($p<0.05$) indicates that there is a difference between the characteristics by food security status among children who receive FSM and among children who do not receive FSM. In the subset of survey questions on children’s mental health, unadjusted and adjusted logistic regression using complete case analysis were run and estimated marginal means obtained. Fully-adjusted analyses were performed with n=1,265 participants. A directed acyclic diagram (DAG) was drawn to assist in the selection of covariates (Supplementary file 3). In fully-adjusted analyses of food insecurity with child mental health, we included child age and sex, child ethnicity, parent occupation, household occupancy, region, receipt of FSM, and an interaction term between food insecurity and FSM. We calculated the probability of our outcome for every combination of food security status and FSM status while holding all covariates at their mean or mode using the “predictions” function in the “marginal effects” package.

Results

Participant characteristics

The majority (78%) of parent respondents were aged 35-54 years old, were professionally employed (61.9%), and lived in households with two or three people (72%) (Table 1). The majority of children were White (78.8%) or Asian (11.4%) and female (57.2%) and just under a third of parents reported that their child received FSM (32%). Over 20% of children reported food insecurity, based on positively responding to any measure, and over a quarter reported that they or their family had visited a food bank (25.9%), placing over a third of children living with food insecurity according to our definition (35%). Among children who affirmed that they received FSM, a tenth (9.7%) expressed

that receiving FSM is embarrassing. Almost a fifth (18%) of children responding to the January-February 2021 survey reported that they felt stressed or worried every day or most days.

Among children who receive FSM, 60% were considered to have food insecurity (Table 2). Parents of children receiving FSM were younger, were more likely to be in a higher level of occupation, and less likely to be of White ethnicity. Over 20% of children who did not receive FSM reported food insecurity. Parents of children who did not receive FSM and had food insecurity were more likely to be younger than those not living with food insecurity. There was no difference in parental occupation between children who did not receive FSM and who lived with or without food insecurity with parents in both groups more likely to have a higher level of occupation. Children who were food insecure and who were in receipt of FSM were more likely to express that receiving FSM is embarrassing (13.1% compared to those who were not in receipt of FSM (4.5%; $p < 0.001$). Children experiencing food insecurity were more likely to report feeling stress or worried every day or most days and this was greater among children in receipt of FSM than not.

Free school meals and potential food insecurity

More children receiving FSM reported any potential food insecurity measure than those not receiving FSM (42.8% among those who received FSM, 9.8% among those who did not; $p < 0.05$). Figure 1 shows the percentage of children responding affirmatively to each of the 6 potential food insecurity questions by FSM status. Children receiving FSM were more likely to respond affirmatively to these questions, though many who did not receive FSM also indicated potential food insecurity. Among all children, the most commonly chosen item reported was having to eat less in order to make food last longer due to a lack of money to buy more food.

Free school meals and food bank use

Both children who did and did not receive FSM reported visiting a food bank, whether by themselves or their family (Figure 2). Children who received FSM were more likely to have reported visiting a food bank by themselves or their family than children not receiving FSM. We found 2.7% of children not receiving FSM visited a food bank by themselves while 9.8% reported their families had visited a foodbank.

Child's mental health

The probability of a child reporting being stressed or worried every day or most days was 31% among those reporting food insecurity and 10% among those not reporting food insecurity, adjusting for confounders (Figure 3). In models additionally examining FSM, the probability of a child reporting being stressed or worried every day was 51% among children with food insecurity and in receipt of FSM (Figure 4). Among children with food insecurity but not in receipt of FSM, the probability was 29%.

Discussion

In this family-based survey measuring experiences of the COVID-19 pandemic, we found a substantial number of children experienced food insecurity (defined here as having ever visited a food bank or experienced any food insecurity measure) regardless of whether they were in receipt of FSM. Food insecurity and measures of potential food insecurity were highest among children in receipt of FSM, likely reflecting the very low income threshold for FSM (currently £7,400), meaning that outside of universal infant provision (in England and Scotland), it is largely children in the very poorest families who receive FSM. In a subset of children with mental health measures, we found

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that children who experienced food insecurity were more likely to report feeling stressed or worried on an almost-daily basis in the previous month compared to children who were food secure.

Children are often protected from hunger in families that experience food insecurity where parents report decreasing their own intake to shield their children [44–47]. We found that children reported their parents skipping meals due to a lack of food in the house. However, it was concerning that we also found children reporting hunger due to not having enough food in the house and almost 20% of all children living with food insecurity reporting having to eat less to make food stretch. The high proportion of children with food insecurity reporting food bank use is consistent with other reports that have highlighted the impact of the pandemic on levels of food insecurity [1]. The consequences of the pandemic on financial stability and, therefore, food insecurity, have also impacted families who may not have been previously affected.

Studies have observed food insecurity among the employed and recent data in the UK Longitudinal Household Study on food insecurity during the pandemic suggests that, while risk of food insecurity increased more for those who were unemployed, those who were persistently employed were also at risk [48–51]. The pandemic has exposed the notion that food insecurity occurs primarily among the unemployed or those less-skilled professions; over 50% of children reporting food insecurity in our data had parents with higher/professional levels of occupation. Educational attainment and income are not necessarily protective of food insecurity. In the 2019/2020 FRS, it was reported that 8% of households where the head of household obtained A-levels or Scottish Highers and 4% of households with further education and university qualifications were food insecure [4]. Likewise, increasing income increased the food security but even among those with a gross weekly income of £1,000 or more only 96% had high food security (meaning 4% experienced food insecurity), compared to 74% of households with a total gross weekly income of less than £200 have high food security.

Over 25% of all children and almost 50% of children living with food insecurity reported their families visiting a food bank. Previous research has suggested that use of food banks by UK households experiencing food insecurity is low [52,53]; however, our study suggests that, in the context of the pandemic, food bank use may have become more common for families experiencing food poverty. Food banks are a short-term ‘emergency’ response and concerns have been raised about the nutritional quality [54,55] and cultural adequacy of the food provided [56]. The emergence and continuation of food banks and the growing number of food parcels they provide may be seen as an example of ‘successful’ self-organisation around a need and conveys a sense that something is being done; however, it should be questioned whether it is the responsibility of the voluntary sector, rather than the Government, to provide access to something as basic as having food of sufficient quality and quantity. Food banks are often unable to provide fresh foods or ensure dietary requirements are met; continued reliance and widespread use of food banks, particularly among households with children, raises concerns about the long-term mental and physical implications for families relying on this form of ‘emergency’ support.

FSM are often seen as an essential tool for mitigating the effects of poverty experienced by children but provision is not universal or standardised across all nations, leading to unequal access (see Patrick et al., 2021). Our data reported more children registered for FSM (32%) compared to those reported eligible in autumn 2020 (19.7%) [29]. This may be reflected by an increase in newly-qualifying children for FSM as families lost income; in the first survey, over 40% of children registered for FSM had only recently started receiving FSM (i.e., were newly eligible that term) [23]. Once children age out of universal provision, stringent criteria must be met for children to receive FSM with many of the criteria being income-based, leading to only very low-income families being eligible and many low-income families going hungry. The eligibility is so restrictive that in our sample

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3 nearly half of families who are food insecure do not receive FSM; the eligibility threshold is set at an
4 annual household income of less than £7,400 prior to benefits while parents receiving Working Tax
5 Credit are ineligible for FSM support regardless of their level of income. However, as we have
6 shown, a large proportion of children experiencing food insecurity as well as those in receipt of FSM
7 have parents employed in professional-level occupations. This suggests that the financial
8 circumstances of families of all income levels have been hard-hit by the pandemic and that the
9 current criteria may not be suitable for assessing eligibility. In addition, our findings that children
10 who were receiving FSM still reported hunger suggests that FSM provision may not be sufficient to
11 ensure that children are adequately fed on a daily basis.
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14 There is limited published research in the UK on the role food insecurity plays in children's mental
15 health, and none on the role of FSM in mitigating the association between food insecurity and poor
16 mental health among children. Emerging UK evidence suggests poorer wellbeing and increased
17 emotional and behavioural problems among children who experience food insecurity. One UK study
18 found 27% of 10-year old children experiencing food insecurity exhibited clinically significant
19 behavioural problems compared to 10% of children who were food secure [57]. Our findings that
20 children who experience food insecurity have worse mental health are therefore unsurprising, and in
21 line with North American literature on food insecurity and child mental health [13–18]. We found
22 that children who reported food insecurity and received FSM had a higher probability of reporting
23 feeling stressed or worried compared to children who did not receive FSM. This could potentially
24 reflect the complex poverty-related stressors of living in a household eligible for FSM, and could
25 indicate a more severe level of socioeconomic deprivation among children reporting food insecurity
26 and receiving FSM, as well as the perceived stigma of receiving FSM [38,58]. Children who received
27 FSM in this survey were asked whether they think it is embarrassing to have FSM and 11.5% of
28 children living with food insecurity thought it was embarrassing compared to 4.1% of children who
29 were food secure. This suggests children may carry an additional burden of stigma on top of
30 inadequate food security.
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34 There are multiple strengths and limitations to this study. This study used a geographic and
35 demographically-representative sample with a wide range of ages and included measures of child-
36 reported food insecurity combined with child reported mental health. However, we were unable to
37 understand the degree to which parents may have helped their child complete the questions, and
38 whether responses were given by them or were changed/given by their parents. This is more likely
39 to have influenced responses from the younger children completing the survey. While the online
40 panel used by ChildWise aims to be as representative as possible across geographic and
41 demographic characteristics, it is possible that families within these representative categories who
42 were more interested in the scope of the survey or who were food insecure would have
43 participated, potentially skewing the responses towards those who experienced food insecurity or
44 received FSM. Other studies conducted during the COVID-19 pandemic have also reported high
45 prevalence of food insecurity, with 16.2% of adults surveyed during the first lockdown reporting
46 experiencing food insecurity while the Understanding COVID-19 longitudinal study survey found the
47 prevalence of food insecurity rose from 7.1% in April 2020 to 20.2% by July 2020 [50,51]. We also
48 combined responses across two surveys and observed that there were fewer parents in the higher
49 occupation category at the second survey (60%) compared to the first survey (65%) but did not find
50 any differences in food insecurity, food bank use, or FSM when we examined participant
51 characteristics by survey, suggesting it was appropriate to combine surveys. As some respondents
52 participated in both surveys, we removed them from the August-September 2020 survey and
53 included them in the January-February 2021 survey in order to maximize sample size for the logistic
54 regression analyses; we examined whether participants who responded to both surveys were
55 different from those responding to only the August-September 2020 survey and found that they
56 were less likely to have visited a food bank or report food insecurity. Removing these participants
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from the analyses did not alter our results. We were unable to explore experiences by more granular categories of ethnicity given small sample sizes among, for example, children of Black ethnicity, preventing examination of how other prevalent ethnic groups experience food insecurity. Similarly, categorisation of occupation into two groups may mask differences between occupations within each group and we only had occupation data for the Chief Income Earner, which may not adequately reflect the socioeconomic position of the household. We were additionally unable to examine the experiences of children who identify outside of the male-female binary as this information was not collected. The questions used to assess food insecurity and child’s mental health were not from a standardised tool and therefore have not been validated; however, these questions still provide insight into the disruption of quality or quantity of food available and state of mind. We also did not stratify the sample to distinguish between children in primary or secondary school, which may reflect differences in how food insecurity is experienced, such as visiting a food bank themselves, as well as differential uptake in FSM regardless of eligibility. We were also unable to differentiate between eligibility and uptake and whether the 23% of children experiencing food insecurity but not receiving FSM were due to non-eligibility or from voluntary refusal as a result of stigma or other reasons for not participating when eligible, such as navigating the application process. Finally, due to the lack of information about parental income and other household financial constraints/resources, it is important to acknowledge that other than food insecurity and eligibility for FSM, we have not been able to identify any other factors (perhaps correlated with food insecurity) that may be impacting upon a child’s mental health. Future research should consider other factors such as parental income, household income and receipt of benefits to help provide a more descriptive and causal picture of the financial status of participants’ households.

Our findings confirm a real need to reconsider the eligibility criteria currently set for the provision of FSM. A concerning number of children are experiencing food insecurity in families with higher/professional levels of education who are likely to be above the eligibility threshold for FSM. While more families can be helped by widening eligibility, and more work is needed to understand access and uptake of FSM, including potential barriers such as social shame, policies which provide universal coverage should be considered as the impact goes beyond food provision and eliminates the stigma that is associated with being eligible and receiving FSM.

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Competing interests

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/disclosure-of-interest/ and declare: support from the Bradford Institute for Health Research and the University of York; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Transparency statement

The corresponding author (TY) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported. No important aspects of the study have been omitted and any discrepancies from the study as originally planned have been disclosed.

Dissemination to participants and related patient and public communities

Findings will be disseminated through media outreach to the general public.

Contributors

TCY, MP, RHM, BL, WB, BD, and MB designed and planned the study. MB acquired the data. TCY performed the statistical analysis and was responsible for the initial draft of the manuscript. All authors were involved in interpreting the study results, revising the manuscript, and approving the final version for submission. MB is the guarantor. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Ethics approval

We performed a secondary analysis of data that were collected externally by ChildWise (commissioned by the Food Foundation). We have discussed the approach taken by ChildWise extensively, who explained that ethical approval is only sought if they feel the questions or topic area are of a sensitive or personal nature. ChildWise surveys have “topic disclaimers” at the start and, where appropriate, respondents are provided with a list of helplines they could reach out to, and potentially sensitive questions include a “prefer not to say” option. When the research was commissioned it was not a pre-existing requirement from the client commissioning ChildWise. Informed consent was not obtained among child participants as parental participation in the survey and their agreement that a child within their household would complete the child’s portion of the survey was taken as assent. Data from this national survey are not identifiable.

Data availability statement

The datasets analysed during the current study are not freely available. Applications to access the data can be made to The Food Foundation.

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Table 1. Characteristics of the survey population.

Total sample n=2166		
	N	Mean (SD)/%
Parent responses		
Parent age		
18-24	8	0.4
25-34	268	12.4
35-44	923	42.6
45-54	762	35.2
55-64	205	9.5
Missing	-	-
Parent occupation		
Higher	1341	61.9
Lower	825	38.1
Missing	-	-
Geographical region		
East Midlands	158	7.3
Eastern	196	9
London	282	13
North East	92	4.2
North West	240	11.1
Northern Ireland	73	3.4
Scotland	161	7.4
South East	300	13.9
South West	197	9.1
Wales	109	5
West Midlands	182	8.4
Yorkshire & Humberside	176	8.1
Missing	-	-
Number in household		
2	160	7.4
3	624	28.8
4	939	43.4
5	318	14.7
6+	125	5.8
Missing	-	-
Child ethnicity		
Asian	245	11.4
Other†	209	9.7
White	1691	78.8
Missing	21	-
Child age (years)	2166	12.4 (3.2)
Missing	-	-

Child sex

Female	1076	49.7
Male	1090	50.3

Missing

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Child receives FSM

Yes	675	31.5
No	1467	68.5

Missing

24 -

Child responses**Potential food insecurity**

Yes	431	20.6
No	1659	79.4

Missing

76 -

Any food bank use

Yes	561	25.9
No	1605	74.1

Missing

- -

Food insecure*

Yes	763	35.2
No	1403	64.8

Missing

- -

Find FSM embarrassing

Yes	62	9.7
No	578	90.3

Missing

1526 -

Stressed/worried†

Every/most days	236	18
Some/rarely	1053	82

Missing

19 -

†The Other ethnicity category includes the following groups: Black African, Black Caribbean, other Black background, mixed, and other background.

*Defined as responding affirmatively to any of the 6 potential food insecurity questions or indicated any food bank use

†Responses available only among a children participating in the January-February 2021 survey

Table 2. Food insecurity and food bank use by children who receive or do not receive free school meals.

	Receives FSM					Does not receive FSM				
	Food insecurity		No food insecurity		<i>p</i> -value [†]	Food insecurity		No food insecurity		<i>p</i> -value [†]
	n=407 (60%)		n=268 (40%)			n=338 (23%)		n=1129 (77%)		
	N	Mean (SD)/%	N	Mean (SD)/%		N	Mean (SD)/%	N	Mean (SD)/%	
Parent age					<0.001					<0.001
18-24	5	1.2	0	0		1	0.3	2	0.2	
25-34	91	22.4	44	16.4		43	12.7	87	7.7	
35-44	194	47.7	115	42.9		167	49.4	436	38.6	
45-54	97	23.8	75	28		107	31.7	474	41.9	
55-64	20	4.9	34	12.7		20	5.9	130	11.5	
Parent occupation					<0.001					0.1
Higher	238	58	106	40		214	63	754	68	
Lower	169	42	162	60		124	37	364	32	
Number in household					0.6					0.2
2	37	9.1	29	10.8		25	7.4	63	5.6	
3	123	30.2	80	29.9		106	31.4	311	27.5	
4	164	40.3	95	35.4		142	42	527	46.7	
5	51	12.5	43	16		46	13.6	177	15.7	
6+	32	7.9	21	7.8		19	5.6	51	4.5	
Child ethnicity					0.04					0.8
Asian	66	16	30	11		35	10.5	110	9.8	
Other	57	14	28	10		30	9	91	8.1	
White	282	70	210	78		268	80.5	916	82	
Child age	407	11.9 (3.1)	268	12.2 (3.2)	0.2	338	11.5 (3.1)	1129	12.9 (3.1)	<0.0001
Child sex					0.6					0.9

Female	182	45	126	47		176	52	580	51
Male	225	55	142	53		162	48	549	49
Child finds FSM embarrassing*					<0.001				
No	313	86.9	233	95.5		-	-	-	-
Yes	47	13.1	11	4.5		-	-	-	-
Child stressed/worried					<0.001				<0.001
Every/most days	102	41	17	10		43	22	68	10
Some/rarely	144	59	145	90		152	78	605	90

[†] χ^2 , Fisher's exact, or Welch's two-sample t-test

*Only children responding affirmatively to receiving FSM were asked about this item

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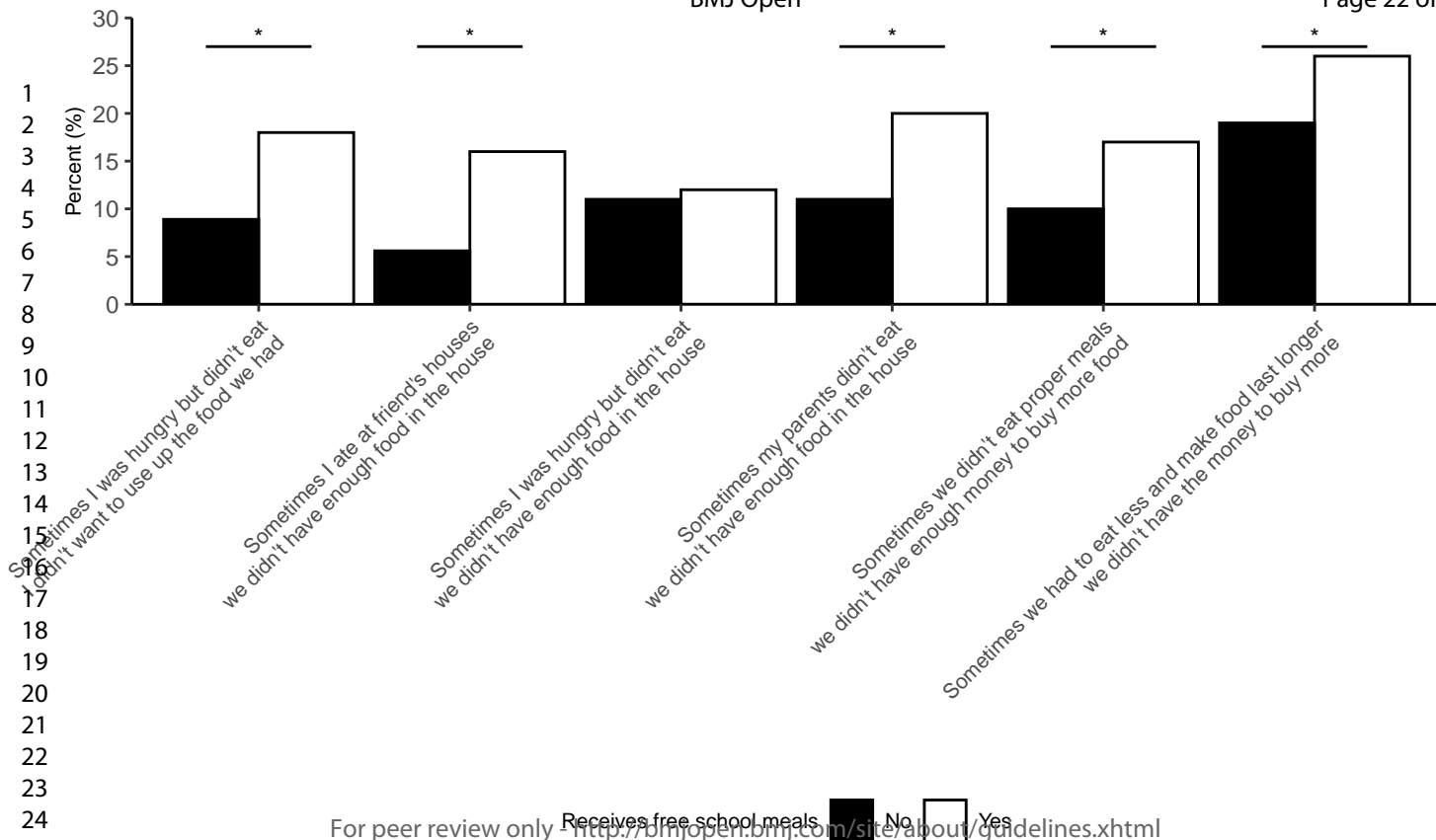
Figure 1. Percentage of children responding affirmatively to the six questions indicating potential food insecurity questions by FSM status.

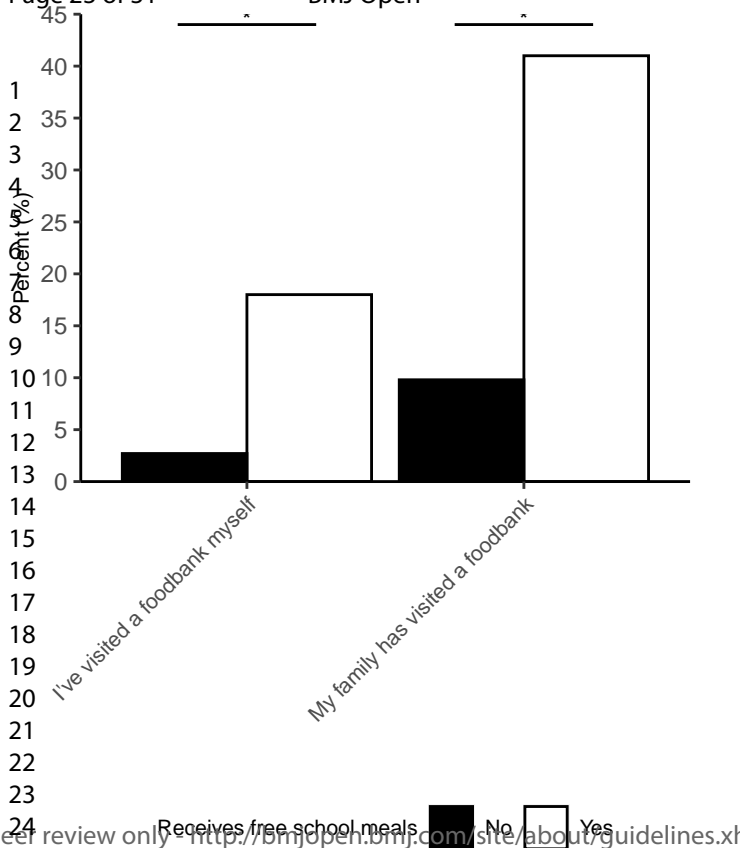
Figure 2. Percentage of children responding affirmatively to two questions indicating food bank use by FSM status.

Figure 3. Probability of a child reporting feeling stressed or worried every day or most days in the past month by food security status.

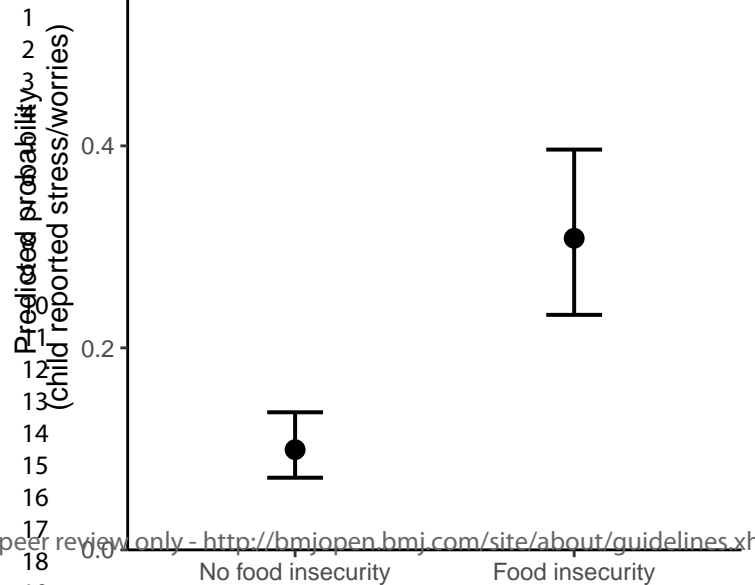
Figure 4. Probability of a child reporting feeling stressed or worried every day or most days in the past month by food security and FSM status.

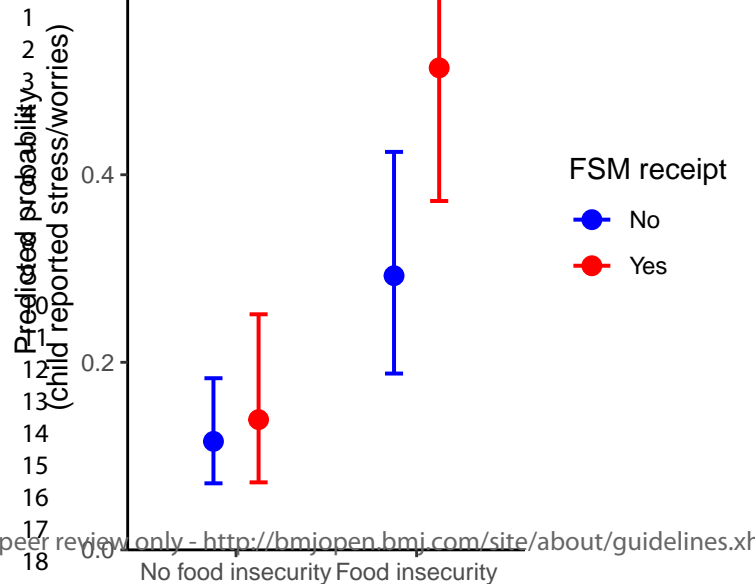
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*p<0.05





Supplemental file 1. Characteristics of the survey population by participants responding to both surveys or to the first survey period (August-September 2020).

	Total sample n=2166		August-September 2020 only N=858		Responded to both surveys N=206		p-value
	N	Mean (SD)/%	N	Mean (SD)/%	N	Mean (SD)/%	
Parent responses							
Parent age							0.07
18-24	8	0.4	1	0.1	0	0	
25-34	268	12.4	112	13.1	18	8.7	
35-44	923	42.6	377	43.9	78	37.9	
45-54	762	35.2	292	34	88	42.7	
55-64	205	9.5	76	8.9	22	10.7	
Missing	-	-	-	-	-	-	
Parent occupation							0.4
Higher	1341	61.9	556	65	126	61	
Lower	825	38.1	302	35	80	39	
Missing	-	-	-	-	-	-	
Geographical region							0.05
East Midlands	158	7.3	68	7.9	6	2.9	
Eastern	196	9	72	8.4	20	9.7	
London	282	13	117	13.6	20	9.7	
North East	92	4.2	38	4.4	7	3.4	
North West	240	11.1	95	11.1	25	12.1	
Northern Ireland	73	3.4	27	3.1	9	4.1	
Scotland	161	7.4	59	6.9	25	12.1	
South East	300	13.9	122	14.2	26	12.6	
South West	197	9.1	76	8.9	15	7.3	
Wales	109	5	43	5.0	13	6.3	
West Midlands	182	8.4	57	7.8	24	11.7	
Yorkshire & Humberside	176	8.1	74	8.6	16	7.8	
Missing	-	-	-	-	-	-	
Number in household							0.4
2	160	7.4	66	7.7	8	3.9	
3	624	28.8	248	28.9	62	30.1	
4	939	43.4	361	42.1	89	43.2	
5	318	14.7	124	14.5	33	16	
6+	125	5.8	59	6.9	14	6.8	
Missing	-	-	-	-	-	-	
Child ethnicity							0.6
Asian	245	11.4	95	11.1	22	10.8	
Other†	209	9.7	69	8.1	21	10.3	
White	1691	78.8	687	80.8	161	78.9	
Missing	21	-	8	-	2	-	

1								
2								
3	Child age (years)	2166	12.4 (3.2)	858	12.4 (3.2)	206	12.5 (3.2)	0.7
4	<i>Missing</i>	-	-	-	-	-	-	
5								
6	Child sex							0.4
7	Female	1076	49.7	422	49	109	53	
8	Male	1090	50.3	436	51	97	47	
9								
10	<i>Missing</i>	-	-	-	-	-	-	
11	Child receives FSM							0.08
12	Yes	675	31.5	260	31	50	24	
13	No	1467	68.5	587	79	156	76	
14								
15	<i>Missing</i>	24	-	11	-	-	-	
16	Child responses							
17								
18	Potential food insecurity							0.2
19	Yes	431	20.6	165	20	31	15	
20	No	1659	79.4	667	80	171	85	
21								
22	<i>Missing</i>	76	-	26	-	4	-	
23	Any food bank use							0.002
24	Yes	561	25.9	224	26	32	16	
25	No	1605	74.1	634	74	174	84	
26								
27	<i>Missing</i>	-	-	-	-	-	-	
28	Food insecure*							0.01
29	Yes	763	35.2	298	35	52	25	
30	No	1403	64.8	560	65	154	75	
31								
32	<i>Missing</i>	-	-	-	-	-	-	
33	Find FSM embarrassing							0.8
34	Yes	62	9.7	26	11	4	8.2	
35	No	578	90.3	214	89	45	91.8	
36								
37	<i>Missing</i>	1526	-	618	-	157	-	

38 †The Other ethnicity category includes the following groups: Black African, Black Caribbean, other Black background,
39 mixed, and other background.
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41 *Defined as responding affirmatively to any of the 6 potential food insecurity questions or indicated any food bank use
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Supplemental file 2. Characteristics of the survey population by survey period

	Total sample n=2166		August-September 2020 N=858		January-February 2021 N=1308		p-value
	N	Mean (SD)/%	N	Mean (SD)/%	N	Mean (SD)/%	
Parent responses							
Parent age							0.3
18-24	8	0.4	1	0.1	7	0.5	
25-34	268	12.4	112	13.1	156	11.9	
35-44	923	42.6	377	43.9	546	41.7	
45-54	762	35.2	292	34	470	35.9	
55-64	205	9.5	76	8.9	129	9.9	
Missing	-	-	-	-	-	-	
Parent occupation							0.03
Higher	1341	61.9	556	65	785	60	
Lower	825	38.1	302	35	423	40	
Missing	-	-	-	-	-	-	
Geographical region							1
East Midlands	158	7.3	68	7.9	90	6.9	
Eastern	196	9	72	8.4	124	9.5	
London	282	13	117	13.6	165	12.6	
North East	92	4.2	38	4.4	54	4.1	
North West	240	11.1	95	11.1	145	11.1	
Northern Ireland	73	3.4	27	3.1	46	3.5	
Scotland	161	7.4	59	6.9	102	7.8	
South East	300	13.9	122	14.2	178	13.6	
South West	197	9.1	76	8.9	121	9.3	
Wales	109	5	43	5.0	66	5.0	
West Midlands	182	8.4	57	7.8	115	8.8	
Yorkshire & Humberside	176	8.1	74	8.6	102	7.8	
Missing	-	-	-	-	-	-	
Number in household							0.4
2	160	7.4	66	7.7	94	7.2	
3	624	28.8	248	28.9	376	28.7	
4	939	43.4	361	42.1	578	44.2	
5	318	14.7	124	14.5	194	14.8	
6+	125	5.8	59	6.9	66	5.0	
Missing	-	-	-	-	-	-	
Child ethnicity							0.1
Asian	245	11.4	95	11.1	151	12	
Other†	209	9.7	69	8.1	140	11	
White	1691	78.8	687	80.8	1004	78	
Missing	21	-	8	-	13	-	
Child age (years)	2166	12.4 (3.2)	858	12.4 (3.2)	1308	12.4 (3.2)	

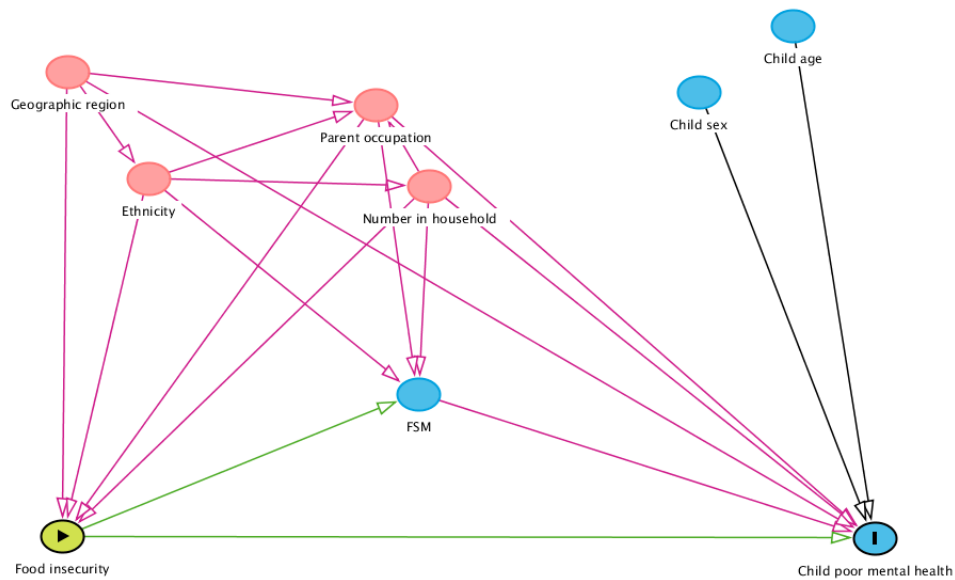
1								
2								
3	Missing	-	-	-	-	-	-	
4	Child sex							0.7
5								
6	Female	1076	49.7	422	49	654	50	
7	Male	1090	50.3	436	51	654	50	
8	Missing	-	-	-	-	-	-	
9	Child receives FSM							0.5
10								
11	Yes	675	31.5	260	31	415	32	
12	No	1467	68.5	587	79	880	68	
13	Missing	24	-	11	-	13	-	
14								
15	Child responses							
16	Potential food insecurity							0.5
17								
18	Yes	431	20.6	165	20	266	21	
19	No	1659	79.4	667	80	992	79	
20	Missing	76	-	26	-	60	-	
21	Any food bank use							0.9
22								
23	Yes	561	25.9	224	26	337	26	
24	No	1605	74.1	634	74	971	74	
25	Missing	-	-	-	-	-	-	
26	Food insecure*							0.7
27								
28	Yes	763	35.2	298	35	465	36	
29	No	1403	64.8	560	65	843	64	
30	Missing	-	-	-	-	-	-	
31	Find FSM embarrassing							0.3
32								
33	Yes	62	9.7	26	11	36	9.0	
34	No	578	90.3	214	89	364	91	
35	Missing	1526	-	618	-	908	-	
36	Stressed/worried†							-
37								
38	Every/most days	236	18	-	-	236	18	
39	Some/rarely	1053	82	-	-	1053	82	
40	Missing	19	-	-	-	19	-	
41								

†The Other ethnicity category includes the following groups: Black African, Black Caribbean, other Black background, mixed, and other background.

*Defined as responding affirmatively to any of the 6 potential food insecurity questions or indicated any food bank use

†Responses available only among a children participating in the January-February 2021 survey.

p-value differences between survey periods

Supplementary file 3. DAG for food insecurity and child mental health.

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract page 1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found page 1-2
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported page 3-4
Objectives	3	State specific objectives, including any prespecified hypotheses page 4
Methods		
Study design	4	Present key elements of study design early in the paper page 4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection page 4
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants page 4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable pages 4-6
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group pages 4-6
Bias	9	Describe any efforts to address potential sources of bias page 6
Study size	10	Explain how the study size was arrived at page 6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why pages 4-6
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding pages 5-6
		(b) Describe any methods used to examine subgroups and interactions pages 6
		(c) Explain how missing data were addressed page 6
		(d) If applicable, describe analytical methods taking account of sampling strategy pages 4,6
		(e) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed page 4,6
		(b) Give reasons for non-participation at each stage page 4
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders page 7
		(b) Indicate number of participants with missing data for each variable of interest page 16-17
Outcome data	15*	Report numbers of outcome events or summary measures page 6-7
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included pages 6-7

		(b) Report category boundaries when continuous variables were categorized
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses page 7
Discussion		
Key results	18	Summarise key results with reference to study objectives pages 6-7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias pages 9-10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence pages 7-10
Generalisability	21	Discuss the generalisability (external validity) of the study results page 8-10
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based page 14

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.